Effect of glycine additives on mesomorphism of sodium dodecylsulfate aqueous solutions

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In recent years, antimicrobial peptides attract much attention of researchers [1]. Unlike isolated from biological materials antimicrobial peptides which have a number of disadvantages (high cost, unpredictable toxicity, etc.), the use of synthetic peptide antibiotics may contribute to their elimination. The key influence of amino acids / peptides on lipopolysaccharide membranes is binding of charged zwitterionic groups with the surface of the bacterial cell membrane external surface and the introduction of hydrophobic fragments of amino acids / peptides into the lipid part of the membrane. For the directed synthesis of effective antimicrobial peptides, it is necessary to study the mechanism of their interaction with compounds modeling biological membranes.

In the alkylsulfates – water binary systems lyotropic mesophases formation takes place. Such lyomesophases are the models of biological membranes. In solutions amino acids exist in zwitterions state. Features of the amino acid structures influence their interaction with ionic surfactants, especially affect the critical micelle concentration, and hence can influence the mesomorphic behavior of such systems. The available data on the effect of various amino acids on the phase diagram of the sodium dodecylsulfate–water system concern only premicellar and micellar areas. We have not found the data on more concentrated systems where the liquid crystal lyotropic mesophase are forming.

In this work, the problem of establishing the effect of the amino acid glycine on the mesomorphic properties of the sodium dodecylsulfate – glycine – water system has been solved. A shift of hexagonal phase formation to lower concentrations of sodium dodecyl sulfate in a system with a saturated aqueous solution of glycine as compared with the binary system of sodium dodecylsulfate – water was set. To interpret the data obtained the quantum-chemical calculations to determine the structure and interaction energy of sodium dodecylsulfate with water and glycine have been made. On the ground of these calculations, we assume that the introduction of the glycine leads to the preferential interaction of the polar groups of the sodium alkylsulfate with this amino acid that increases the volume of the polar part of the molecule. The consequence is changing the micelles surface radius of curvature which leads to reducing the critical micelle concentration as well as the concentration of the hexagonal phase formation.

Acknowledgements This work was supported by RFBR (grant No 15-43-03003r_center_a) and partly fulfilled in the framework of the state assignment of the Ministry of Education of the Russian Federation (grant No 4.106.2014 K).

[1] A. Giuliani, A.C. Rinaldi *Antimicrobial Peptides: Methods and Protocols*, 2010, 424 p., Humana Press, New York: USA.